[FEB 2 6 2010]

MEMORANDUM

SUBJECT: Model Clearinghouse Review of Modeling Procedures for Demonstrating
Compliance with $PM_{2.5}$ NAAQS

FROM: Tyler Fox, Leader
Air Quality Modeling Group, C439-01

TO: Erik Snyder, Lead Regional Modeler
Air Planning Section (6PD-L), EPA Region 6

Jeff Robinson, Chief
Air Permits Section (6PD-R), EPA Region 6

INTRODUCTION

In response to your memorandum of February 4, 2010, the Model Clearinghouse has reviewed
Region 6's position on the proposed modeling demonstration of compliance with the $PM_{2.5}$
National Ambient Air Quality Standard (NAAQS) by Nucor Corporation for the proposed pig
iron plant in St. James Parish, LA. The memorandum specifically requested a review of the
selection of the background monitoring site and the proposed methodology for calculating the
total ambient air quality concentration combining the monitored background and modeled $PM_{2.5}$
concentrations.

Nucor Corporation originally submitted a Title V and Prevention of Significant Deterioration
(PSD) permit application for a proposed pig iron plant to be located in St. James Parish,
Louisiana in May 2008. Following several application amendments, the facility submitted a
modeling analysis in August 2009, which relied on the PM_{10} surrogate policy regarding $PM_{2.5}$
compliance that was in effect at the time. In light of EPA's current position as to how states
should implement the surrogate policy in their permitting process, as reflected in our response to
the petition regarding the Louisville Gas and Electric (LG&E) Title V permit, EPA Region 6
urged the Louisiana Department of Environmental Quality (LDEQ) to either justify using PM_{10}
as an appropriate surrogate for $PM_{2.5}$ or request Nucor to conduct a $PM_{2.5}$ modeling analysis. A
dispersion modeling protocol for demonstrating compliance with $PM_{2.5}$ NAAQS was submitted
to LDEQ and EPA for review in October 2009. Upon review EPA Region 6 and LDEQ
requested that additional years and monitors be evaluated for establishing a representative
background monitor for $PM_{2.5}$.

On November 19, 2009 Nucor Corporation submitted a revised modeling protocol for the assessment of $PM_{2.5}$ impacts associated with the proposed pig iron plant to be located in the St. James Parish in Louisiana. The revised protocol proposed the use of the maximum modeled annual average and maximum 8th highest 24-hour average $PM_{2.5}$ concentration to be added to the representative background concentration and compared with the $PM_{2.5}$ NAAQS. Nucor proposed to calculate the background concentration by averaging the 98th percentile from years 2007-2008 because it believes 2006 is not representative of normal background air quality conditions for Louisiana.

MODEL CLEARINGHOUSE RESPONSE

Based on the information presented in the Region 6 request, the Model Clearinghouse concurs with Region 6's position regarding the selection of the Bayou Plaquemine monitoring site for determining background $PM_{2.5}$ concentrations, and on the requirement to include 2006 monitoring data. While we concur with the application of procedures consistent with Appendix N to 40 CFR Part 50 for determining background monitored concentrations for $PM_{2.5}$ NAAQS analyses, in order to be consistent with those procedures the 2006 monitoring data must be considered unless specific $PM_{2.5}$ observations were requested to be excluded for comparison with the relevant NAAQS by the LDEQ and approved by the EPA pursuant to the requirements established under 40 CFR § 50.14 to address exceptional events. In the absence of an exceptional events declaration, the 2006 data must be considered. In any case, the monitored background $PM_{2.5}$ concentration included in a cumulative impact assessment should be based on 3 years of monitoring data, to be consistent with the form of the NAAQS.

Given the generic issues associated with $PM_{2.5}$ dispersion modeling and the specifics of this case, the Model Clearinghouse cannot endorse aspects of the modeling protocol presented by Nucor and approved by EPA Region 6 for the proposed pig iron plant. Specifically, we cannot concur with the use of the highest of the 8th highest (98th percentile) modeled 24-hour impacts from the 5-year meteorological record for the modeled component of the cumulative impact assessment. Our position is based on a concern that cumulative $PM_{2.5}$ impacts estimated based on this approach may not be protective of the 24-hour $PM_{2.5}$ NAAQS, due to the method proposed for combining the 98th percentile monitored background concentration with the 98th percentile modeled concentration, in the form of the highest 8th high (H8H) value over five years of modeling. Combining the 98th percentile monitored value with the 98th percentile modeled concentrations for a cumulative impact assessment would result in a value that is below the 98th percentile of the combined cumulative distribution and would therefore not be protective of the NAAQS. The Model Clearinghouse recommends use of the average of the 1st highest modeled 24-hour impacts over 5 years as the modeled contribution to the cumulative NAAQS compliance analysis. It should also be noted that the use of a 3-year average for monitored design values to determine attainment of the NAAQS does not preempt the Appendix W requirement for use of 5 years of National Weather Service (NWS) data, and the 5-year average of modeled impacts serves as an unbiased estimate of the 3-year average for purposes of modeling demonstrations of compliance with the NAAQS.

EPA will be following up this Model Clearinghouse memorandum with additional clarification regarding appropriate modeling procedures for demonstrating compliance with $PM_{2.5}$ NAAQS, as well as issues associated with use of the PM_{10} surrogate policy in light of recent EPA regulatory actions and proposals.

cc: Richard Wayland, C304-02
        Bill Harnett, C504-01
        Raj Rao, C504-01
        Roger Brode, C439-01
        Bret Anderson, C439-01
        Dan deRoeck, C504-01
        EPA Regional Modeling Contacts

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MEMORANDUM

SUBJECT: Protocol for Modeling of 24-Hour and Annual Impacts Under the New $PM_{2.5}$ NAAQS

FROM: Erik Snyder, Lead Regional Modeler
Air Planning Section (6PD-L)

Jeff Robinson, Chief
Air Permits Section (6PD-R)

TO: Tyler Fox, Leader
Air Quality Modeling Group (C439-1)
Office of Air Quality Planning and Standards

This memorandum seeks the review and concurrence from the EPA Model Clearinghouse on Region 6's acceptance and approval of modeling methodologies for $PM_{2.5}$ impacts associated with the proposed Prevention of Significant Deterioration (PSD) permit for the Nucor Corporation pig iron facility in St. James Parish, Louisiana. These techniques will be used to determine compliance with both the 24-hour and annual averaging periods for the new $PM_{2.5}$ national ambient air quality standards (NAAQS). Since the petition was granted on the Louisville Gas and Electric (LG&E) facility in August 2009 there has been a lack of formal guidance on how to address $PM_{2.5}$ modeling analyses for PSD permitting actions. Without the benefit of formal written guidance from the Office of Air Quality Planning and Standards, the U.S. Environmental Protection Agency (EPA) Region 6 approved the $PM_{2.5}$ NAAQS analysis techniques discussed below in an email to the Louisiana Department of Environmental Quality (LDEQ) on January 12, 2010.

BACKGROUND

Nucor Corporation originally submitted a Title V and PSD permit application for a proposed pig iron plant to be located in St. James Parish, Louisiana, in May 2008. Through several application amendments, a permit proposal (October 15, 2008), and iterations of

modeling the facility submitted their latest modeling in August 2009. After review of the last submittal the Louisiana Department of Environmental Quality (LDEEQ) was ready to make the draft permit available for a public comment period in late September. In September, EPA Region 6 discussed the recent LG&E petition and urged LDEQ to either justify using the PM10 modeling as a surrogate for $PM_{2.5}$ or request Nucor to conduct a $PM_{2.5}$ modeling analysis. The LDEQ proposed the draft Title V and PSD permit September 2, 2009. Then on September 25, 2009, LDEQ canceled the public hearing and public comment period, and requested Nucor to submit a $PM_{2.5}$ modeling protocol. A protocol was submitted to LDEQ and EPA for review in October 2009. Upon review, EPA Region 6 and LDEQ requested additional years and monitors be evaluated for establishing a representative background monitor for $PM_{2.5}$

On November 19, 2009, Nucor Corporation submitted a revised modeling protocol (with two supplements in early December) for the modeling of $PM_{2.5}$ impacts. The revised protocol proposed the use of the maximum annual average and maximum 8th highest 24-hour average $PM_{2.5}$ concentration to be added to the representative background concentration and compared with the $PM_{2.5}$ NAAQS. Nucor proposed to calculate the background concentration by averaging the 98th percentile from years 2007-2008 because it believes 2006 is not representative of normal background air quality conditions for Louisiana.

BACKGROUND MONITOR SELECTION

To calculate the total air quality concentration for comparison against an NAAQS, it is necessary to consider background monitored concentrations to characterize the influence of emissions from naturally occurring sources and sources not identified explicitly in the modeling analysis. Under Section 8.2 of Appendix W, a series of general guidelines are offered to aid in the selection of background monitoring sites. However, due to the unique character of $PM_{2.5}$ being a mixture of both primary and secondary particulate matter, monitor site selection is complicated by the necessity to insure that the monitoring site selected adequately characterizes the secondary components of $PM_{2.5}$ but is not burdened by impacts of direct $PM_{2.5}$ from the source or sources explicitly modeling in the NAAQS analysis. Therefore, careful consideration must be given to the representativeness of the monitoring site selected.

In discussions with the state of Louisiana and Nucor representatives, EPA Region 6 outlined the following for selection of the background $PM_{2.5}$ monitor and concentration for the $PM_{2.5}$ dispersion modeling analyses.

1. Use the Geismar monitor (St. Gabriel Agricultural Exp. Station) in Iberville Parish as the background monitor unless justification can be provided to use another monitor.

2. To determine the background concentration, use a three year period (2006 – 2008). Use the highest annual average over this period. Use the highest 24-hour average concentration if the sampling period is one every six days and the second highest 24-hour average concentration if the sampling period is one every 3 days. The 98th percentile can be used if the sampling frequency is daily.

The proposed pig iron plant site is located in St. James Parish and is in a rural agricultural environment along the Mississippi River. There are some industrial facilities located along the river, but the Nucor site is not in a heavily industrialized area. The Geismar monitor, initially recommended by EPA Region 6, is sited in an industrial environment. This monitor is located approximately 25 km from the Nucor site. Nucor believed that this area is not representative of the proposed pig iron facility site and that an alternate monitor should be used for assigning background $PM_{2.5}$ concentrations. Nucor recommended that the Bayou Plaquemine monitor in the Iberville Parish be used as the background monitor. This monitor is in a rural agricultural environment that is similar to the Nucor site. Although the monitor is located 47 km from the site, it is located within the study area. In order to avoid the potential for "double counting" impacts from sources of primary PM that are to be explicitly modeled in the NAAQS analysis but yet select a monitor which adequately characterizes the regional secondary component of PM, EPA Region 6 concurred with the proposed alternative site.

Constructing the 98th Percentile Monitored Background Value

In the modeling protocol, Nucor recommended that the development of representative background PM2.5 concentrations be limited to the years 2007 and 2008. Although a three-year period is required to construct design value concentrations for $PM_{2.5}$ under Appendix N to 40 CFR Part 50, Nucor argued that monitoring data for $PM_{2.5}$ was unusually elevated at many LDEQ monitors in the state during 2006, suggesting that unusual outside factors created an anomaly during this year.

Nucor supplemented their protocol with additional information in December 2009 which identified events which they believed influenced the 2006 monitor values and would make this year unrepresentative for defining background concentrations. Nucor contended that Louisiana experienced unusual drought conditions in 2006, and that the number of local and regional wildfires was significantly higher than average. Monitored concentrations of $PM_{2.5}$ during 2006 resulted in a 98th percentile background concentration more than 50% higher than any other year under consideration. Nucor argued that $PM_{2.5}$ monitoring data during 2006 should be considered a naturally caused anomaly that is not representative of background conditions in the State of Louisiana and excluded from consideration for construction.

However, Nucor offered no definitive analysis including such things as receptor modeling of chemically speciated $PM_{2.5}$ data, satellite imagery, aerosol optical depths, or back trajectory analyses to support the arguments presented in the November and December 2009 submittals to EPA. Neither has the state of Louisiana formally requested an exceptional events declaration on 2006 $PM_{2.5}$ monitoring data to exclude such data from consideration. In the absence of any such analysis, EPA Region 6 required that the 2006 monitoring year data for the Bayou Plaquemine monitor be included for calculating the 3-year average of the 98th percentile $PM_{2.5}$ values for the background concentration.

Calculating the Total Air Quality Concentration

As described in Section 8.2 of Appendix W, background monitored concentrations are an essential element to calculating the total air quality concentration for comparison with the

NAAQS under review. How to combine the monitored background data with modeled impacts from the source(s) under review is an important question which is technically challenging given the unique form of the new 24-hour $PM_{2.5}$ NAAQS.

Under Section 8.3.1.2 (a) of Appendix W, 5-years of representative meteorological data are recommended to ensure that the worst case meteorological conditions are adequately represented in the modeling results. Since the New Source Review (NSR) implementation rule for the new $PM_{2.5}$ 24-hour NAAQS was only promulgated in May 2008 and the PM10 surrogate policy was in effect until the June 2009 administrative stay of the "grandfathering provision" related to the surrogate policy, full modeling guidance detailing how model results from the 5-years recommended by Appendix W should be combined with the background monitoring data to calculate the total air quality concentration was not available at the time of submission of the Nucor protocol.

Since each of the years of the 5-year meteorological record should be complete, the air quality model will calculate 365 independent 24-hour concentrations for each meteorological year. The 8th highest concentration value in the 365-day distribution of modeled impacts corresponds to the 98th percentile value under Appendix N to 40 Code of Federal Regulations (CFR) Part 50. A possible methodology to combine modeled impacts with the background concentrations to calculate a total air quality concentration consistent with the form of the 24-hour $PM_{2.5}$ NAAQS would be to average each of the 8th highest concentrations from the 5-years modeled and combine this value with the background monitored value. In summary, this procedure would combine the average 98th percentile modeled impact with the 98th percentile monitor concentration to form the total air quality concentration, which we believe would be consistent with how design value concentrations are determined under Appendix N to 40 CFR Part 50.

Nucor, in its protocol, proposed to use the highest of the 8th high modeled impacts from the 5-year meteorological record. This value would be added to the background monitored value described in the previous section to calculate the total air quality concentration and then compared to the 24-hour $PM_{2.5}$ NAAQS. EPA Region 6 believes that this approach is consistent with the form of $PM_{2.5}$ NAAQS, albeit it should be slightly more conservative since it would use the highest of the 8th high concentrations rather than an average of such. EPA Region 6 concurs with the use of this methodology to combine modeled and monitored concentrations to compare to the $PM_{2.5}$ NAAQS.

For demonstrating compliance with the annual $PM_{2.5}$ NAAQS, Nucor will model annual concentrations of $PM_{2.5}$ to be added to the monitored annual design value (2006-2008 data). Nucor will utilize the maximum modeled annual average $PM_{2.5}$. The resulting cumulative annual concentration will then be compared to the annual $PM_{2.5}$ NAAQS.

Requested Actions Items

Please review the background monitoring site selection, and background concentration calculation methodology. Please also review the methodology of calculating the total air quality concentration which combines the 3-year average of the 98th percentile monitoring value with the

highest of 8th high modeled concentration from the 5-year meteorological record. Please also review the methodology for demonstrating compliance with the annual $PM_{2.5}$ NAAQS.

   Please call Erik Snyder at (214) 665-7305 if you have any questions or require additional information.